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(54) **METHOD AND APPARATUS FOR DETECTING A GESTURE**

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CPC ***G06F 3/04883*** (2013.01); *G06F 3/017* (2013.01); *G06F 3/041* (2013.01); *G06F 3/0484* (2013.01); *G06F 3/04847* (2013.01)

(58) **Field of Classification Search**

USPC 345/156, 173

See application file for complete search history.

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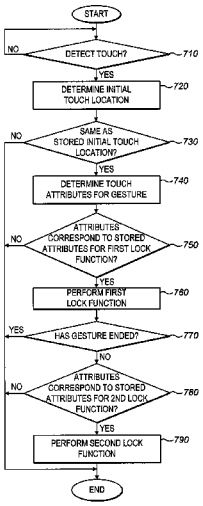
(57) **ABSTRACT**

A method includes detecting a swipe gesture from an initial touch location on a touch-sensitive display of an electronic device; determining touch attributes for the swipe gesture; and performing a lock function if the touch attributes correspond to a stored swipe gesture associated with the lock function. Further lock functions may be activated by detection of attributes of a further stored swipe gesture.

45 Claims, 4 Drawing Sheets



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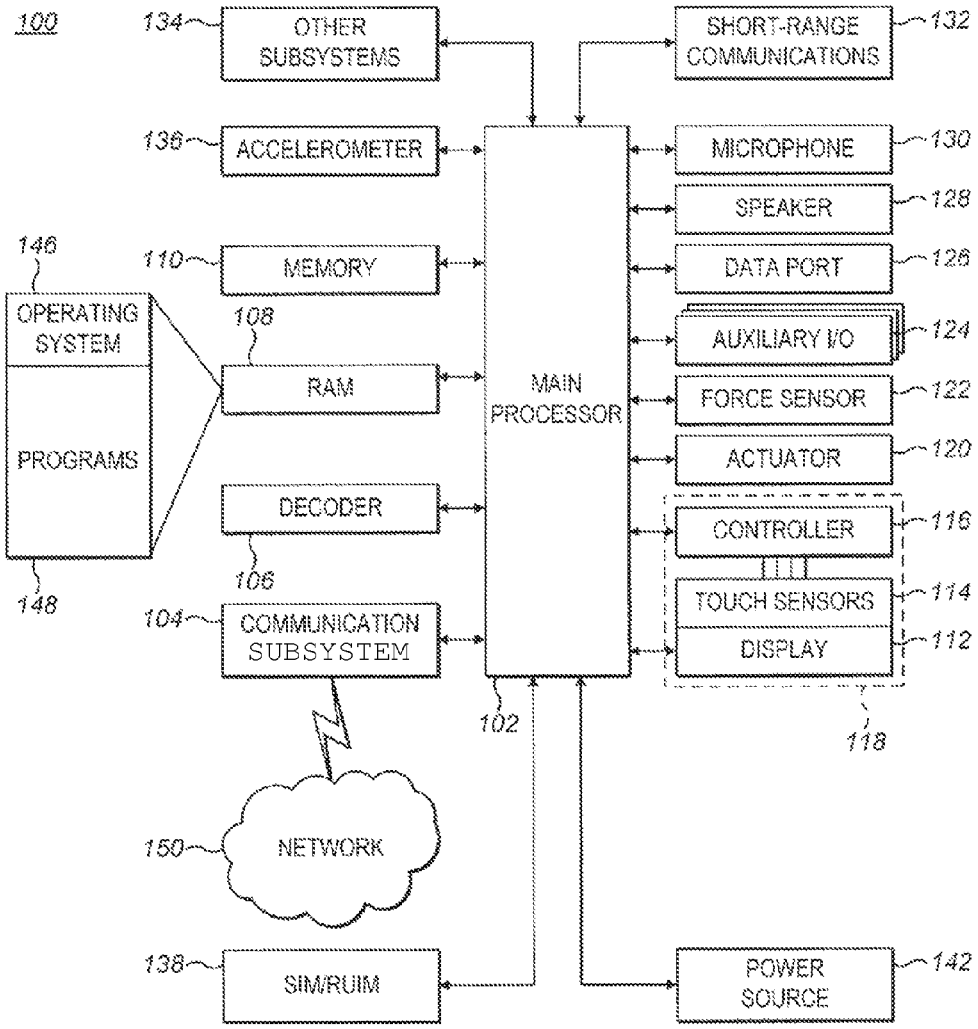
100
134
OTHER SUBSYSTEMS
SHORT-RANGE COMMUNICATIONS
132
136
ACCELEROMETER
MICROPHONE
130
SPEAKER
128
146
110
MEMORY
DATA PORT
126
OPERATING SYSTEM
108
AUXILIARY I/O
124
RAM
MAIN PROCESSOR
FORCE SENSOR
122
PROGRAMS
ACTUATOR
120
DECODER
CONTROLLER
116
106
148
TOUCH SENSORS
114
104
COMMUNICATION SUBSYSTEM
DISPLAY
112
102
118
150
NETWORK
138
SIM/RUIM
POWER SOURCE
142

FIG. 1

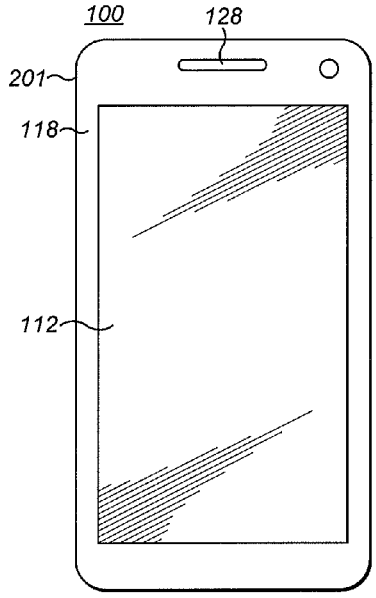

FIG. 2

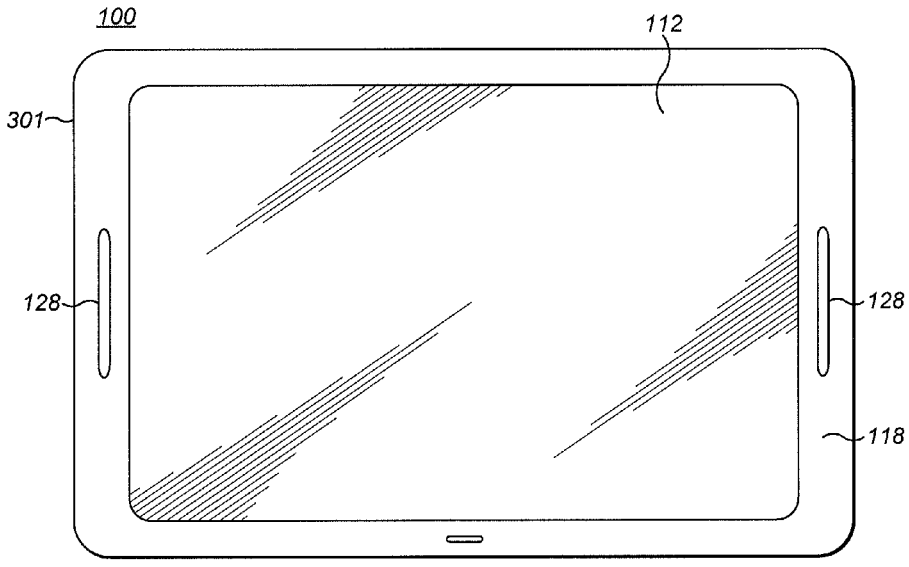

FIG. 3

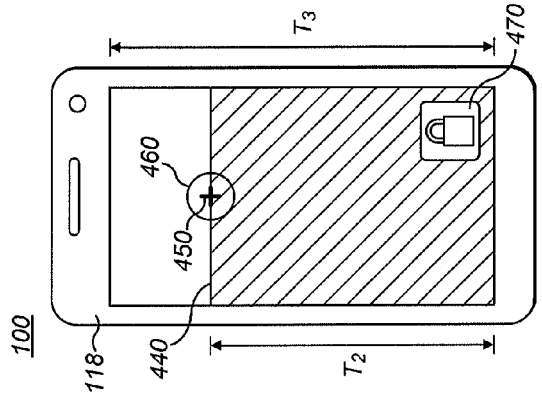

FIG. 6

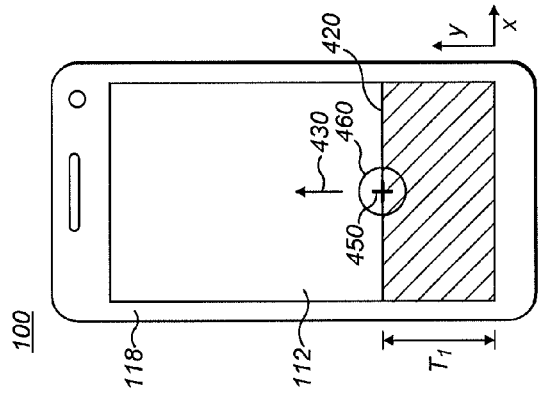

FIG. 5

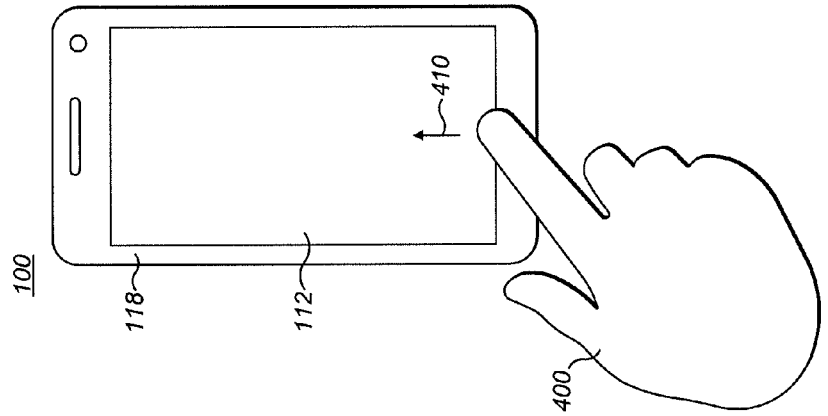

FIG. 4

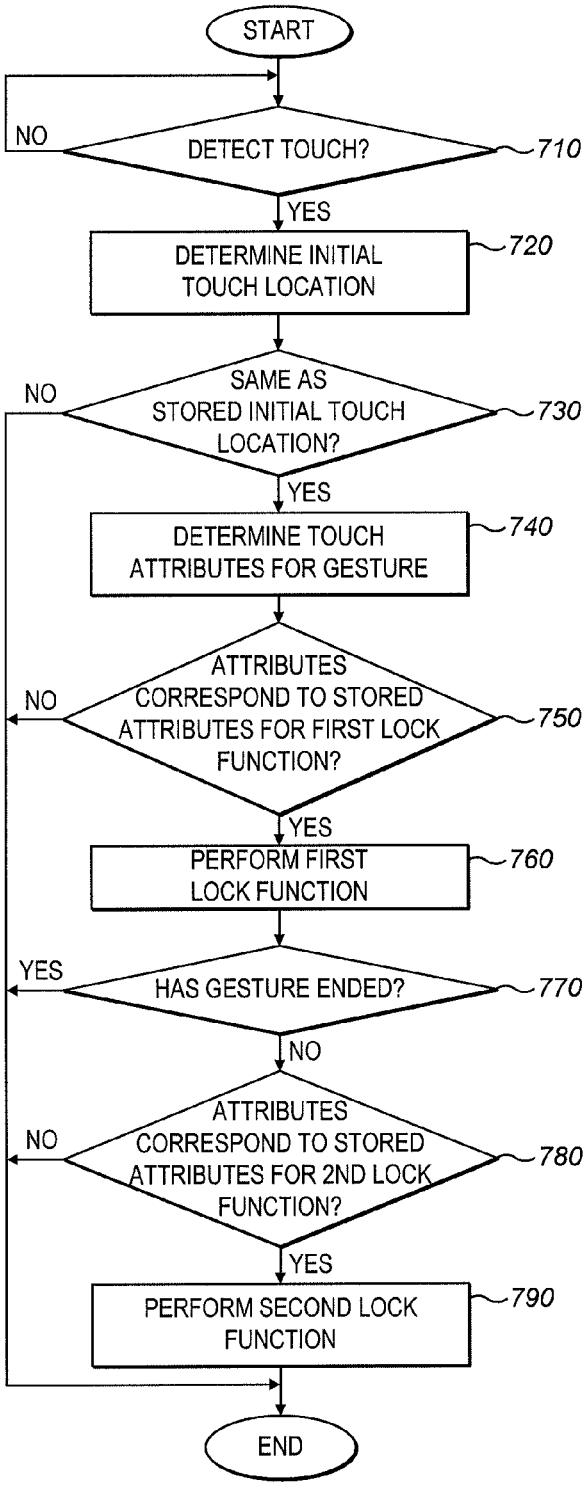
START
DETECT TOUCH?
710
NO
YES
DETERMINE INITIAL TOUCH LOCATION
720
SAME AS STORED INITIAL TOUCH LOCATION?
730
NO
YES
DETERMINE TOUCH ATTRIBUTES FOR GESTURE
740
ATTRIBUTES CORRESPOND TO STORED ATTRIBUTES FOR FIRST LOCK FUNCTION?
750
NO
YES
PERFORM FIRST LOCK FUNCTION
760
HAS GESTURE ENDED?
770
YES
NO
ATTRIBUTES CORRESPOND TO STORED ATTRIBUTES FOR 2ND LOCK FUNCTION?
780
NO
YES
PERFORM SECOND LOCK FUNCTION
790
END

FIG. 7

METHOD AND APPARATUS FOR DETECTING A GESTURE

FIELD OF THE TECHNOLOGY

The present disclosure relates to electronic devices, including but not limited to, portable electronic devices having touch-sensitive displays and their control.

BACKGROUND

Electronic devices, including portable electronic devices, have gained widespread use and may provide a variety of functions including, for example, telephonic, electronic messaging and other personal information manager (PIM) application functions. Portable electronic devices include, for example, several types of mobile stations such as simple cellular telephones, smart phones, wireless personal digital assistants (PDAs), and laptop computers with wireless 802.11[1] or Bluetooth capabilities.

Portable electronic devices such as PDAs or smart telephones are generally intended for handheld use and ease of portability. Smaller devices are generally desirable for portability. A touch-sensitive display, also known as a touchscreen display, is particularly useful on handheld devices, which are small and have limited space for user input and output. The information displayed on the touch-sensitive displays may be modified based on the functions and operations being performed.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a block diagram of a portable electronic device in accordance with the disclosure.

FIG. **2** is a front view of an example of a smartphone in accordance with the disclosure.

FIG. **3** is a front view of an example of a tablet computer in accordance with the disclosure.

FIG. **4** illustrates an example of touch attributes of a swipe gesture in accordance with the disclosure.

FIG. **5** illustrates a further example of touch attributes of a swipe gesture in accordance with the disclosure.

FIG. **6** illustrates a further example of touch attributes of a swipe gesture in accordance with the disclosure.

FIG. **7** is a flowchart illustrating a method of the disclosure.

DETAILED DESCRIPTION

The following describes an apparatus for and method of locking a device based on input received from a touch-sensitive display.

For simplicity and clarity of illustration, reference numerals may be repeated among the figures to indicate corresponding or analogous elements. Numerous details are set forth to provide an understanding of the examples described herein. The examples may be practiced without these details. In other instances, well-known methods, procedures, and components are not described in detail to avoid obscuring the examples described. The description is not to be considered as limited to the scope of the examples described herein.

The disclosure generally relates to an electronic device, such as a portable electronic device or non-portable electronic device. Examples of portable electronic devices include mobile, or handheld, wireless communication devices such as pagers, cellular phones, cellular smart-phones, wireless organizers, personal digital assistants, wirelessly enabled notebook computers, tablet computers, mobile internet devices, electronic navigation devices, and so forth. The portable electronic device may be a portable electronic device without wireless communication capabilities, such as handheld electronic games, digital photograph albums, digital cameras, media players, e-book readers, and so forth. Examples of non-portable electronic devices include desktop computers, electronic white boards, smart boards utilized for collaboration, built-in monitors or displays in furniture or appliances, monitors, displays, televisions and so forth.

A block diagram of an example of an electronic device **100** is shown in FIG. **1**. The electronic device **100** includes multiple components, such as a processor **102** that controls the overall operation of the electronic device **100**. Communication functions, including data and voice communications, are performed through a communication subsystem **104**. Data received by the electronic device **100** may be decompressed and decrypted by a decoder **106**. The communication subsystem **104** receives messages from and sends messages to a wireless network **150**. The wireless network **150** may comprise any type of wireless network, including, but not limited to, data wireless networks, voice wireless networks, and networks that support both voice and data communications. A power source **142**, such as one or more rechargeable batteries or a port to an external power supply, powers the electronic device **100**.

The processor **102** interacts with other components, such as a Random Access Memory (RAM) **108**, memory **110**, a touch-sensitive display **118**, one or more actuators **120**, one or more force sensors **122**, an auxiliary input/output (I/O) subsystem **124**, a data port **126**, a speaker **128**, a microphone **130**, short-range communications **132** and other device subsystems **134**. The touch-sensitive display **118** includes a display **112** and touch sensors **114** that are coupled to at least one controller **116** that is utilized to interact with the processor **102**. Input via a graphical user interface is provided via the touch-sensitive display **118**. Information, such as text, characters, symbols, images, icons, and other items that may be displayed or rendered on an electronic device, is displayed on the touch-sensitive display **118** via the processor **102**. The processor **102** may also interact with an accelerometer **136** that may be utilized to detect direction of gravitational forces or gravity-induced reaction forces.

To identify a subscriber for network access, the electronic device **100** may utilize a Subscriber Identity Module, a Removable User Identity Module (SIM/RUIM) card **138**, or alternatively a Universal Integrated Circuit Card (UICC) or an embedded Universal Integrated Circuit Card (eUICC), for communication with a network, such as the wireless network **150**. Alternatively, user identification information may be programmed into memory **110**.

The electronic device **100** includes an operating system **146** and software programs, applications, or components **148** that are executed by the processor **102** and are typically stored in a persistent, updatable store such as the memory **110**. Additional applications or programs may be loaded onto the electronic device **100** through the wireless network **150**, the auxiliary I/O subsystem **124**, the data port **126**, the short-range communications subsystem **132**, or any other suitable subsystem **134**. Short-range communications subsystem **132** may include any or all of Bluetooth®, Radio-frequency identification (RFID) & near field communications (NFC) technologies. The electronic device may, therefore, in at least some example embodiments, include a near field communications (NFC) subsystem. The NFC subsystem is configured to communicate with other electronic devices and/or tags, using an NFC communications protocol. NFC is a set of short-range wireless technologies which typically require a

distance of 4 cm or less for communications. The NFC subsystem may include an NFC chip and an NFC antenna. In at least some example embodiments, the short-range communication subsystem may be a wireless bus protocol compliant communication mechanism such as a Bluetooth® communication module or a Wi-Fi module to provide for communication with similarly-enabled systems and devices. Any one, any combination, or all of these wireless communications technologies may be included in communications sub-system **104**, or short-range communications subsystem **132**.

A received signal such as a text message, an e-mail message, or web page download is processed by the communication subsystem **104** and input to the processor **102**. The processor **102** processes the received signal for output to the display **112** and/or to the auxiliary I/O subsystem **124**. A subscriber may generate data items, for example e-mail messages, which may be transmitted over the wireless network **150** through the communication subsystem **104**. For voice communications, the overall operation of the electronic device **100** is similar. The speaker **128** outputs audible information converted from electrical signals, and the microphone **130** converts audible information into electrical signals for processing.

The touch-sensitive display **118** may comprise any suitable touch-sensitive display, such as a capacitive, resistive, infrared, surface acoustic wave (SAW) touch-sensitive display, strain gauge, optical imaging, dispersive signal technology, acoustic pulse recognition, and so forth. A capacitive touch-sensitive display includes one or more capacitive touch sensors **114**. The capacitive touch sensors may comprise any suitable material, such as indium tin oxide (ITO).

One or more touches, also known as touch contacts or touch events, may be detected by the touch-sensitive display **118**. The processor **102** may determine attributes of the touch, including a location of the touch. Touch location data may include data for an area of contact or data for a single point of contact, such as a point at or near a center of the area of contact. The location of a detected touch may include x and y components, e.g., horizontal and vertical components, respectively, with respect to one's view of the touch-sensitive display **118**. For example, the x location component may be determined by a signal generated from one touch sensor, and the y location component may be determined by a signal generated from another touch sensor. A touch may be detected from any suitable input member, such as a finger, thumb, appendage, or other objects, for example, a stylus (active or passive), pen, or other pointer, based on the nature of the touch-sensitive display **118**. Multiple simultaneous touches may be detected.

One or more gestures may also be detected by the touch-sensitive display **118**. A gesture, such as a swipe, also known as a flick, is a particular type of touch on a touch-sensitive display **118** and may begin at an origin point and continue to an end point, for example, a concluding end of the gesture. A gesture may be identified by attributes of the gesture, including the origin point, the end point, the distance travelled, the duration, the velocity, and the direction, for example. A gesture may be long or short in distance and/or duration. Two points of the gesture may be utilized to determine a direction of the gesture. A gesture may also include a hover. A hover may be a touch at a location that is generally unchanged over a period of time or is associated with the same selection item for a period of time.

The optional actuator(s) **120** may be depressed or activated by applying sufficient force to the touch-sensitive display **118** to overcome the actuation force of the actuator **120**. The actuator(s) **120** may be actuated by pressing anywhere on the touch-sensitive display **118**. The actuator(s) **120** may provide input to the processor **102** when actuated. Actuation of the actuator(s) **120** may result in provision of tactile feedback.

Optional force sensors **122** may be disposed in conjunction with the touch-sensitive display **118** to determine or react to forces applied to the touch-sensitive display **118**. The force sensor **122** may be disposed in line with a piezo actuator **120**. The force sensors **122** may be force-sensitive resistors, strain gauges, piezoelectric or piezoresistive devices, pressure sensors, quantum tunneling composites, force-sensitive switches, or other suitable devices.

The touch-sensitive display **118** includes a display area in which information may be displayed, and a non-display area extending around the periphery of the display area. The display area generally corresponds to the area of the display **112**. Information is not displayed in the non-display area by the display, which non-display area is utilized to accommodate, for example, electronic traces or electrical connections, adhesives or other sealants, and/or protective coatings around the edges of the display area. The non-display area may be referred to as an inactive area and is not part of the physical housing or frame of the electronic device. Typically, no pixels of the display are in the non-display area, thus no image can be displayed by the display **112** in the non-display area. Optionally, a secondary display, not part of the primary display **112**, may be disposed under the non-display area. Touch sensors may be disposed in the non-display area, which touch sensors may be extended from the touch sensors in the display area or distinct or separate touch sensors from the touch sensors in the display area. A touch, including a gesture, may be associated with the display area, the non-display area, or both areas. The touch sensors may extend across substantially the entire non-display area or may be disposed in only part of the non-display area.

A front view of an example electronic device **100** that is a portable electronic device **201** is illustrated in FIG. **2**. A front view of an example electronic device **100** that is a tablet computer **301** is illustrated in FIG. **3**.

Touch sensors **114** detect touch input, thus providing the device **100** with an interface to identify gestures based on detected touch locations, series of consecutive touch locations and swipe gestures having certain attributes as described above. The resolution of the touch sensors **114** in electronic devices **100** may be an imprecise indication of the actual location of the touch. The touch location has an associated amount of uncertainty, for example approximately 1 mm to approximately 9 mm based on the spacing of touch sensors **114** and other factors.

FIG. **4** shows a device **100** to which a gesture is applied by a user **400**. An example of a method according to the invention will now be described in relation to FIGS. **4** to **6**. FIG. **4** shows a user **400** applying a swipe gesture from an initial touch location. In the illustrated case, the initial touch location is at a perimeter of the touch sensitive display **118**. Touch sensitive display **118** may comprise a display **112** and the touch sensitive area **118** may further extend outside of the display **112**. Further, the touch sensitive area may be provided on a separate part of device **100** adjacent the display **112**. For the purposes of this disclosure, a touch sensitive display **118** includes any touch sensitive area substantially adjacent display **112**. On detection of a gesture beginning at an initial touch location, device **100** determines touch attributes of the gesture. These touch attributes can include the initial touch location, along with any other touch attributes discussed above. In the illustrated example, device **100** compares touch attributes of the detected gesture with touch attributes of a stored gesture. The stored gesture may be associated with a

lock function of the device **100**. The stored touch attributes may include an initial touch location on the touch sensitive display **118**. The stored initial touch location may be defined at any point on touch sensitive display **118** of device **100**. In one embodiment, the stored initial touch location may be defined as a touch location at, or adjacent to, a perimeter of the touch sensitive display, as illustrated in FIG. **4**. The touch attributes for the stored gesture may include a second touch location. The second touch location may be defined as a point at a predefined distance from the initial touch location. The predefined distance may be a distance along a certain predefined axis of the display, or may be a predefined distance having a predefined magnitude in any direction on the display. Further, as in the example of FIG. **4**, the gesture may begin at the initial touch location of the gesture made by the user **400** and progress away from the initial touch location, for example, in a direction of arrow **410**. A threshold value of any other suitable touch attribute may alternatively or additionally be used to define the stored gesture. Although in the example described, the swipe gesture is illustrated as having a generally upward direction beginning at an example initial location at or adjacent to the lower perimeter of the device, other directions and other initial locations may be used.

FIG. **5** illustrates an example where the gesture includes a swipe from the touch location of FIG. **4** to that illustrated by touch location **450** and/or touch area **460**. Touch attributes of the gesture may therefore be the initial location shown in FIG. **4** and the further touch location **450** illustrated in FIG. **5**.

FIG. **5** shows a touch location **450** and a corresponding touch area **460**. A touch area **460** may compensate for inherent imprecision of determination of a touch location **450**.

The touch area **460** may be derived from touch data received from the touch sensors **114** for a detected touch. A touch area **460** may alternatively be a virtual area around the touch location **450**, such as the touch area **460**.

The size of the virtual touch area **460** may be based on known characteristics, e.g., uncertainties and inaccuracies, of the touch sensors **114**. For example, when the resolution for a touch location **450** is 6 mm, the device **100** may generate a 6 mm radius virtual touch area **460** around a touch location to compensate.

Although a circle is utilized for the touch area **460** in the examples herein, other shapes may be utilized. For example, a custom shape that more accurately represents the contact shape of a finger or stylus touching a touch-sensitive display may be utilized. Other input data may determine the shape or size of the touch area **460**. For example, the shape of the touch area **460** may be angled based on orientation information received from the accelerometer **136** because the orientation of the device **100** may affect the angle of contact with the touch-sensitive display **118**.

For example, in FIG. **4**, a touch location **450** is detected and an associated circular touch area **460** is generated. When the touch location **450** changes to another location, information may be provided as to the angle of the touch input. Adjusting for the angle may reduce uncertainty of touch location perpendicular to direction of change of location of the touch. The touch area may optionally be updated to reflect the direction of change.

An attribute of the stored gesture may be a threshold value T_1. In the illustrated example, T_1 is defined as a threshold value in the direction of a Y-axis of display **100** and the threshold is therefore illustrated as a straight line **420** across the touch sensitive display **118** of device **100**. Therefore, if the gesture includes a second touch location beyond threshold T_1, then a process in the device may compare these touch attributes and decide that the touch attributes correspond to a stored swipe gesture. This swipe gesture may be associated with a lock function of the device **100**. Therefore, a swipe gesture from an initial touch location illustrated in FIG. **4**, to a further touch location, beyond a threshold value T_1 from the initial touch location, can activate a lock function of the device **100**.

It may be desirable to allow a user to activate a plurality of different lock functions of device **100**, depending upon touch attributes relating to a distance between an initial touch location of the gesture and a further touch location of the gesture. In this way, device **100** may select one of a plurality of lock functions depending upon the distance of a touch location of the gesture from the initial touch location of the gesture. In this way, device **100** may activate a first lock function after the gesture passes threshold T_1. However, the user may continue the gesture beyond threshold T_1 in the direction of arrow **430** and a further lock function may be activated when a touch location of the gesture exceeds a second threshold, such as T_2 shown in FIG. **6**.

FIG. **6** illustrates further threshold T_2, which may be a further distance from the initial touch location illustrated in FIG. **4**. Here, the threshold T_2 is illustrated by a straight line **440** across touch sensitive display **118**. Threshold T_2 may however be defined as a magnitude of a distance between an initial touch location and a further touch location of the gesture, by a total distance along a path followed by the gesture or by a threshold value of any other suitable touch attribute. In general, the further threshold T_2 may be any touch attribute having a magnitude greater than threshold T_1. Upon detecting that a touch attribute has exceeded threshold T_2, the device may activate a second lock function, different from the first lock function activated after threshold T_1 is passed.

Device **100** may activate the relevant lock function only when a release of the gesture is detected beyond threshold T_1 or T_2. In this way, if a user continues the gesture in a reverse direction such that the threshold T_1 is no longer exceeded before releasing the gesture, then the device may not activate the lock function associated with threshold T_1. The same may apply to the threshold T_2.

Upon passing either of thresholds T_1 or T_2, the device may further set display **112** to display a lock function indicator **470**. Lock function indicator **470** may further define a lock function touch area. Detection of a touch at the lock function touch area, defined in relation to lock function indicator **470**, may activate a further lock function of the device **100**. The lock function indicator **470** may only be displayed for a predetermined period and then be removed from the display, along with the lock function touch area. The lock function indicator may change appearance, or disappear, on detection of a touch at the lock function indicator.

A further threshold T_3 may be defined. T_3 may be defined as a touch location at a perimeter substantially opposite the perimeter at which an initial touch location is defined. Therefore, a gesture beginning at a first perimeter of the display **112** and ending at a second, optionally opposite, perimeter of the display **112** or **118** may cause the device **100** to initiate a locking function of the device. Further thresholds T_n may be implemented to define further lock functions of the device at further thresholds T_n of touch attributes of the device. As such, any number of thresholds T_n may be defined as corresponding to any number of different locking functions of device **100**.

Further visual indications of the device having detected the gesture as having touch attributes associated with a lock function may be implemented to give an indication to the user that a lock function may be activated upon release of the gesture. One example can be described in relation to the areas each

side of line **420** in FIG. **5**, or line **440** in FIG. **6**. The device **100** may adjust the display **112** as the progression of the touch location **450** of the gesture is updated. The display may be updated to adjust display parameters of the part of the display between the initial touch location and the current touch location, so that the appearance of the area between the initial touch location and the current touch location is different to the area beyond the current touch location. As an example, the screen may be darkened in the area between the initial touch location and the current touch location, so that as the gesture progresses along display **112** in a y-direction, the display is progressively darkened. This can provide a clear indication to the user that the device considers a gesture associated with a lock function to have been detected. Such progressive adjustment of display properties can also help to indicate to the user when any of thresholds T_1, T_2 or T_3 is considered reached by the gesture as detected by device **100**.

It can therefore be seen that touch attributes of a swipe gesture applied to a touch sensitive display of a device **100** can be associated with multiple lock functions and, by use of a single gesture, a user can initiate one or more lock functions in device **100** without a need for multiple touches or multiple gestures. Further touches may be provided to activate further locking function options if desired.

Locking functions may include any of the following: activating a screen lock, activating a device lock, and activating a lock of certain functionality of the device. A screen lock may comprise setting a mode of the device wherein at least some touch input from the touch sensitive display is ignored. All touch input may be ignored when a screen lock is activated, unless touch input is required to unlock the screen, in which case only certain gestures may be used to unlock the screen. This advantageously avoids inadvertent "pocket dialing" wherein an unintended phone call is made or other touch events inadvertently occur while the device is in a user's pocket or purse, etc. This advantageously further avoids the potential costs associated with an accidental phone call or other accidental action. This advantageously further avoids other undesirable consequences, such as embarrassment or breach of confidentiality resulting from a conversation that is inadvertently overheard or a message that is inadvertently forwarded as a result of accidental touch inputs. In embodiments in which the device comprises a keyboard and/or other keys or buttons, inputs such as key or button presses may be ineffective while screen lock (which may also be referred to as a keyboard lock) is active. This advantageously avoids unintentional key presses while the device is in a user's pocket or purse, etc. Certain keys or buttons may be allowed to function while the screen lock (or keyboard lock) is active, such as a key or button used to make an emergency phone call, or a key or button used to power off the device, etc. The display may further be darkened, dimmed or switched off when the screen lock is active. Darkening, dimming or switching off the display advantageously reduces power consumption and extends battery life. In some embodiments, the device may display a screensaver or status information such as the date and time, etc. while screen lock is active. The device may also enter a standby mode or low-power mode when the screen lock is activated.

Locking functions may further include activating a device lock. A device lock may do any of the following: lock one or more services of the device, prevent access to the device over certain RF or wired links such as Bluetooth or USB access, and add security measures, such as requiring a password, PIN-code, biometric data, or other authentication token for accessing the device. If a password or other token is required to unlock a locked device, the locking function may be referred to as a password lock. A device lock may be considered an extension of the screen lock function, adding additional security beyond the screen lock and so to allow the user to lock the device as an extension of a gesture used to lock the screen provides a more convenient user interface. In one example of a device lock, which may sometimes be referred to as a partial device lock, certain applications or services or other resources of the device are inaccessible, while others are accessible. In one example of a partial device lock which may sometimes be referred to as a perimeter lock, wherein a perimeter generally refers to a logical group of resources that share a common management scheme governing their use, one or more perimeters of the device are locked while one or more perimeters of the device are unlocked. A device may comprise multiple perimeters, such as a work or enterprise perimeter, and a personal or recreational perimeter. A work perimeter may comprise work-related data and applications (such as customer relationship software, enterprise collaboration software, etc.) and other resources classified as work-related, and a personal perimeter may comprise personal-related data and applications (such as social networking applications, games, etc.) and other resources classified as personal. The perimeter lock may provide for the user to lock certain functions or resources of the device, such as those associated with a work or enterprise perimeter, with a gesture having a first set of touch attributes, and lock certain other functions or resources of the device, such as those associated with a personal or recreational perimeter of the device, if the gesture has a second set of touch attributes. The ability to provide such multiple locking functions can be desirable in particular in light of the increasing use of personal devices for work functions and there is therefore an increasing need for the ability to lock certain functions of the device more quickly, more easily, or more regularly than others.

The lock function may only be recognized by the device when the home screen is displayed. The detection of the gestures described herein for locking the device may therefore be disabled when the device is not showing the home screen. This can be beneficial, since a user often returns to the home screen before locking the device. A similar gesture may be used to return to the home screen as for locking the device, which provides a simple combination of similar gestures to both return to the home screen and to lock the device. Therefore, the same detection steps described herein in relation to a lock function may be used to activate a function which returns the user to the home screen. The method steps may further be applied to other non-locking functions of the device if desired.

A flowchart illustrating a method of detecting gestures associated with a lock function or functions is shown in FIG. **7**. The method may be carried out by software executed, for example, by the processor **102**. Coding of software for carrying out such a method is within the knowledge of a person of ordinary skill in the art given the present description. The method may contain additional or fewer processes than shown and/or described, and may be performed in a different order. Computer-readable code executable by at least one processor of the portable electronic device to perform the method may be stored in a computer-readable medium, which may be a non-transitory or tangible storage medium.

When a touch is detected **710** by the touch-sensitive display **118**, touch data, including a touch location, is provided to the processor **102**. For example, the touch location may be an x, y coordinate and may include additional touch information such as a time stamp, pressure information or other attributes obtainable from touch sensors **114**. An initial touch location of a swipe gesture is determined **720** based on the

received touch location. The touch location may be determined based on the raw touch input data or by establishing a virtual touch location, or a virtual touch area, based at least on the touch input data.

The initial touch location for the swipe gesture is compared **730** with a stored initial touch location for a locking function. Here, if the initial touch location does not correspond to the stored initial touch location for a locking function, then the process ends. If the detected initial touch location is the same as the stored initial touch location, then touch attributes are determined **740** for the gesture. The touch attributes determined at **740** are then compared **750** with stored touch attributes for a gesture corresponding to a lock function. This may be done after a delay, and/or repeated until either a gesture corresponding to a lock function is detected, or until a release of the gesture is detected. If the touch attributes for the gesture do not correspond to the stored touch attributes for a gesture associated with a lock function, then the process may end. However, if the touch attributes determined for the gesture do correspond to a stored gesture for the lock function, then the lock function is performed **760**. It is then determined **770** whether the gesture has ended if this has not already been established. The gesture usually finishes with a release of the touch and so if the touch has been released, then the gesture is considered to have ended and the process ends. However, if the gesture has not ended and a touch is still detected, then the method may optionally compare **780** the gesture with a second set of touch attributes stored for a second gesture associated with a second lock function at **780**. If the detected attributes correspond to stored attributes for a gesture associated with a second lock function, then the second lock function will be performed **790**. If the detected attributes do not correspond to stored attributes for a gesture associated with the second lock function, then the process ends without performing a second lock function. Further instances of comparison step **780** and locking function performing step **790** may be included for further locking functions if desired. As set out above, it may be desirable to repeat steps **740** and **750** until either a release is detected or touch attributes corresponding to a lock function are detected, so that attributes of the gesture may be compared at multiple steps before ending the process. This may allow a sufficient number of iterations for the user to have described the gesture which is associated with a lock function before the process is ended. Alternatively or additionally, a delay may be provided between steps **730** and **740** so that a user has time to describe a suitable gesture before comparison step **750** is executed.

The implementation described is an illustrative example of one of many possible implementations envisioned by this disclosure. Other implementations may choose a different ordering, different weightings, and different combinations. Modifications to the examples may be made utilizing techniques to improve the efficiency and reduce computation or provide other advantages.

The present disclosure may be embodied in other specific forms without departing from its spirit or essential characteristics. The described examples are to be considered in all respects only as illustrative and not restrictive. The scope of the disclosure is, therefore, indicated by the appended claims rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

The invention claimed is:

1. A method comprising:

receiving a swipe gesture from an initial touch location on a touch-sensitive display of an electronic device;

determining touch attributes for the swipe gesture, the touch attributes comprising a touch location of the swipe gesture;

performing a first lock function when the swipe gesture progresses to a first touch location on the touch-sensitive display that is beyond a first threshold from the initial touch location, wherein the first lock function locks a first set of functionalities of the electronic device; and

performing a second lock function when the swipe gesture progresses to a second touch location on the touch-sensitive display that is beyond a second threshold from the initial touch location, wherein the second lock function locks a second, different set of functionalities of the electronic device and the second threshold is beyond the first threshold.

2. The method of claim **1**, wherein the initial touch location is substantially at or substantially adjacent to an edge of the touch-sensitive display.

3. The method of claim **1**, wherein the first lock function and the second lock function are associated with respective stored touch attributes each comprising a stored initial touch location, and wherein the initial touch location of the swipe gesture corresponds to the initial touch location stored for the first lock function and to the initial touch location stored for the second lock function.

4. The method of claim **3**, further comprising:

comparing the determined touch attributes to the touch attributes stored for the first lock function; and

comparing the determined touch attributes to the touch attributes stored for the second lock function.

5. The method of claim **1**, wherein at least one of the first and second thresholds is defined by a distance along an axis of the touch-sensitive display from the initial touch location.

6. The method of claim **1**, wherein at least one of the first and second thresholds is defined by a distance along a path followed by the swipe gesture from the initial touch.

7. The method of claim **1**, further comprising visually altering a graphical output of the touch-sensitive display as the swipe gesture proceeds, to provide a visual indication of the impending activation of the lock function.

8. The method of claim **1**, wherein detecting a release of the swipe gesture activates the first lock function and the second lock function.

9. The method of claim **1**, wherein the second lock function adds additional security to the first lock function.

10. The method of claim **9**, wherein at least one of the first and second lock functions comprises at least one of: locking a service, locking an application, a device lock, a partial device lock, or a perimeter lock.

11. The method of claim **1**, wherein the first threshold defines a swipe having a first length, and the second threshold defines a swipe having a second length longer than the first length.

12. The method of claim **1**, wherein the first lock function comprises a screen lock.

13. The method of claim **1**, wherein the second lock function comprises a device lock.

14. The method of claim **1**, further comprising presenting a lock function indicator on the display if at least one stored swipe gesture is detected.

15. The method of claim **14**, further comprising activating a lock function upon receiving a touch input at the lock function indicator.

16. An electronic device configured to perform a method comprising:

receiving a swipe gesture from an initial touch location on a touch-sensitive display of an electronic device;

determining touch attributes for the swipe gesture, the touch attributes comprising a touch location of the swipe gesture;

performing a first lock function when the swipe gesture progresses to a first touch location on the touch-sensitive display that is beyond a first threshold from the initial touch location, wherein the first lock function locks a first set of functionalities of the electronic device; and

performing a second lock function when the swipe gesture progresses to a second touch location on the touch-sensitive display that is beyond a second threshold from the initial touch location, wherein the second lock function locks a second, different set of functionalities of the electronic device and the second threshold is beyond the first threshold.

17. The electronic device of claim **16**, wherein the initial touch location is substantially at or substantially adjacent to an edge of the touch-sensitive display.

18. The electronic device of claim **16**, wherein the first lock function and the second lock function are associated with respective stored touch attributes each comprising a stored initial touch location, and wherein the initial touch location of the swipe gesture corresponds to the initial touch location stored for the first lock function and to the initial touch location stored for the second lock function.

19. The electronic device of claim **16**, wherein the method further comprises:

comparing the determined touch attributes to the touch attributes stored for the first lock function; and

comparing the determined touch attributes to the touch attributes stored for the second lock function.

20. The electronic device of claim **16**, wherein at least one of the first and second thresholds is defined by a distance along an axis of the touch-sensitive display from the initial touch location.

21. The electronic device of claim **16**, wherein at least one of the first and second thresholds is defined by a distance along a path followed by the swipe gesture from the initial touch location.

22. The electronic device of claim **16**, wherein the method further comprises visually altering a graphical output of the touch-sensitive display as the swipe gesture proceeds, to provide a visual indication of the impending activation of the lock function.

23. The electronic device of claim **16**, wherein detecting a release of the swipe gesture activates the first lock function and the second lock function.

24. The electronic device of claim **16**, wherein the second lock function adds additional security to the first lock function.

25. The electronic device of claim **16**, wherein the first threshold defines a swipe having a first length, and the second threshold defines a swipe having a second length longer than the first length.

26. The electronic device of claim **16**, wherein the first lock function comprises a screen lock.

27. The electronic device of claim **16**, wherein the second lock function comprises a device lock.

28. The electronic device of claim **16**, wherein at least one of the first and second lock functions comprises at least one of: locking a service, locking an application, a device lock, a partial device lock, or a perimeter lock.

29. The electronic device of claim **16**, wherein the method further comprises presenting a lock function indicator on the display if at least one stored swipe gesture is detected.

30. The electronic device of claim **29**, further comprising activating a lock function upon receiving a touch input at the lock function indicator.

31. A non-transitory computer-readable storage medium having computer-readable code executable by at least one processor of a portable electronic device to perform operations comprising:

receiving a swipe gesture from an initial touch location on a touch-sensitive display of an electronic device;

determining touch attributes for the swipe gesture, the touch attributes comprising a touch location of the swipe gesture;

performing a first lock function when the swipe gesture progresses to a first touch location on the touch-sensitive display that is beyond a first threshold from the initial touch location, wherein the first lock function locks a first set of functionalities of the electronic device; and

performing a second lock function when the swipe gesture progresses to a second touch location on the touch-sensitive display that is beyond a second threshold from the initial touch location, wherein the second lock function locks a second, different set of functionalities of the electronic device and the second threshold is beyond the first threshold.

32. The non-transitory computer-readable storage medium of claim **31**, wherein the initial touch location is substantially at or substantially adjacent to an edge of the touch-sensitive display.

33. The non-transitory computer-readable storage medium of claim **31**, wherein the first lock function and the second lock function are associated with respective stored touch attributes each comprising a stored initial touch location, and wherein the initial touch location of the swipe gesture corresponds to the initial touch location stored for the first lock function and to the initial touch location stored for the second lock function.

34. The non-transitory computer-readable storage medium of claim **33**, wherein the operations further comprise:

comparing the determined touch attributes to the touch attributes stored for the first lock function; and

comparing the determined touch attributes to the touch attributes stored for the second lock function.

35. The non-transitory computer-readable storage medium of claim **31**, wherein at least one of the first and second thresholds is defined by a distance along an axis of the touch-sensitive display from the initial touch location.

36. The non-transitory computer-readable storage medium of claim **31**, wherein at least one of the first and second thresholds is defined by a distance along a path followed by the swipe gesture from the initial touch.

37. The non-transitory computer-readable storage medium of claim **31**, wherein the operations further comprise visually altering a graphical output of the touch-sensitive display as the swipe gesture proceeds, to provide a visual indication of the impending activation of the lock function.

38. The non-transitory computer-readable storage medium of claim **31**, wherein detecting a release of the swipe gesture activates the first lock function and the second lock function.

39. The non-transitory computer-readable storage medium of claim **31**, wherein the second lock function adds additional security to the first lock function.

40. The non-transitory computer-readable storage medium of claim **39**, wherein at least one of the first and second lock functions comprises at least one of: locking a service, locking an application, a device lock, a partial device lock, or a perimeter lock.

41. The non-transitory computer-readable storage medium of claim 31, wherein the first threshold defines a swipe having a first length, and the second threshold defines a swipe having a second length longer than the first length.

42. The non-transitory computer-readable storage medium of claim 31, wherein the first lock function comprises a screen lock.

43. The non-transitory computer-readable storage medium of claim 31, wherein the second lock function comprises a device lock.

44. The non-transitory computer-readable storage medium of claim 31, wherein the operations further comprise presenting a lock function indicator on the display if at least one stored swipe gesture is detected.

45. The non-transitory computer-readable storage medium of claim 44, wherein the operations further comprise activating a lock function upon receiving a touch input at the lock function indicator.

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